Wall Street as a Quantitative Workplace

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FE Club Talk
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What will happen today

The goal:
- explain what people with quantitative skills actually do on Wall Street
- describe different types of employers
- describe different job roles available

Outline/scope:
- what Wall Street consists of – industry structure
- Internal organization of Wall Street firms
- History of Wall Street technology
- Job roles – how to apply your quantitative skills
- Workplace realities
What is Wall Street

- **Our working definition:**
  - firms where an FE graduate can find interesting work
  - generally, financial services companies involved with trading of securities and other assets

- **What is NOT Wall Street:**
  - real estate
  - most securities issuers:
    - corporations, governments/agencies, municipalities
    - retail banking

- **In the US:**
  - total employment in financial industry: ~5 million
  - total employment on Wall Street: ~250 thousand
  - of which technology: ~70 thousand
The two sides of Wall Street

- **Buy-side:**
  - asset managers/investors (real money)
  - speculators (fast money)

- **Sell-side:**
  - Large “investment banks”
    - active in both primary and secondary markets
    - act as brokers and/or dealers for buy-side firms

- **Middle:**
  - intermediaries:
    - interdealer brokers
    - exchanges
    - service providers
Picture the flows

Issuers

US Treasury  Fannie Mae  General Motors

Sell-side

Goldman  Merrill  Lehman

Garban  CBOT

Buy-side

Blackrock  PIMCO  CALPERS  DE Shaw  Bank of England  Boeing
Inside a broker-dealer

- between 5,000 and 25,000 people overall
- split into divisions
- where would you end up, most likely?
  - trading, risk management, or technology

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**Top management**

- **Legal/Compliance**
  - Investment Banking
  - Asset management
  - Retail/prime brokerage

- **Revenue-producing**
  - Equities

- **Technology**
  - Fixed Income

- **Risk Management**
Inside a trading division

- between 500 and 5000 people overall
- split into business lines and further subdivided into individual trading desks by product areas
- each desk is 5-25 traders plus assistants etc
- there is also sales organization that works across product areas
How a trading business operates

A salesperson’s day:
- call each of your accounts
- solicit trades:
  - if a customer wants to trade, pass the request to the appropriate trading desk
  - get sales credits if you bring in a trade
- performance: total sales credits

A trader’s day:
- respond to customer inquiries
  - quote prices
  - execute trades
- performance: total PnL (profit and loss)
- manage risk and PnL of your books
- provide closing prices for your securities
Front, middle, and back

- Front office: writes trade tickets
  - all customer-facing activities:
    - sales/trading
    - research
- Back office: turns them into money
  - trade processing
    - trade records
    - Reconciliation/clearing
    - settlement
    - official risk and PnL reports
- Middle office:
  - the plumbing between front and back
How a buy-side firm operates

- Portfolio managers:
  - Work with a pool of money from outside investors
  - Decide how to invest it:
    - What to buy and sell
    - When and how much

- Traders:
  - Do the actual buying and selling in accordance with portfolio manager’s instructions
  - Initiate transactions with sell-side firms and pay transaction costs

- Performance measure: investment returns
Where do we belong in this picture?

- Why does this money-making machine need people with quantitative and technology backgrounds:
  - Wall Street’s basic operating model changed little since 18th century (buy low, sell high).
  - It has a long tradition of using new technology to gain a competitive edge (railroads/telegraph)
  - In the last 40 years, Wall Street absorbed so much information technology that it now needs a workforce of technology professionals.

- To understand what technical people do on Wall Street today, we need to review how they got there
History of Wall Street Technology

The beginning – 1960s

Front office:
- Phones and tape machines

Back office:
- Messengers running around Manhattan with bags of trade tickets
- NYSE had to close on Wednesdays to ease the back office load

Computers enter Wall Street’ back offices:
- Major broker-dealers started buying mainframe computers to automate trade processing
- With these computers came people who formed the seeds of modern technology organizations
History of Wall Street Technology

- The turmoil – 1970s
  - Huge changes in the marketplace:
    - Bretton Woods
    - Inflation
  - New financial products:
    - Financial futures
    - Options
  - Computers enter front office:
    - Analytics
      - Bonds
      - Options
    - Market data

![Graph showing Fed funds rate, Gold standard goes, Options (CBOE), Financial futures over years 1955-1980.](image)
History of Wall Street Technology

**Coming of age – 1980s**
- Interest rate derivatives take off:
  - LIBOR futures
  - Swaps
  - Bond options
- Computer revolution:
  - From mainframes to VAX to PC to UNIX
  - Each trading desk can now build its own models/technology
- Quants:
  - hard-sciences professionals working for individual trading businesses
- Financial theory:
  - Most models used today developed during this time
Wall Street technology: 1990

- Going corporate:
  - desk level:
    - quants remain with business
    - programmers move to divisional level
  - division level:
    - technology groups serving specific businesses
    - research departments
  - firm-wide level:
    - modern payments systems
    - databases
    - networks
    - market data

Diagram:
- Desk quants
- Programmers
- Quasi-academic research
- IT
  - Databases
  - Networks
  - Market data
- Risk mgmt
1994 and the birth of risk management

The heyday – early 1990s:
- Golden age of structured credit products
- REMICS/CMO in mortgages
- Both businesses are impossible without complex pricing models:
  - Term structure models
  - Prepayment models
- Feb 1994 – end of the party:
  - Sudden rise in rates caused huge losses and structured business dried up
- Never again – risk management as the cure:
  - Most banks adopted modern risk management practices
  - Brought in a lot of people and technology to implement them
Wall Street technology matures: 1995 – 2000

- New developments:
  - Internet craze:
    - Huge number of developers hired to build web portals etc
  - Markets go electronic:
    - Electronic execution
    - Electronic market-making
    - Algorithmic trading
  - Credit derivatives
    - Mostly done by division-level development groups
  - The IT organization takes its present size:
    - Thousands of people
    - Billion-dollar budgets

- IT:
  - Front-office software development
  - Core analytics
  - Databases
  - Networks
  - Market data
  - E-trading infrastructure
  - Risk mgmt
  - Desk quants
  - Quasi-academic research
Wall Street Technology Today

- **desk level:**
  - pure quants increasingly rare
  - almost all desk needs are met by division-level IT/research

- **division level:**
  - research departments mostly absorbed by IT
  - quant/programmer line blurred again

- **firm-wide level:**
  - many divisional tasks migrate to firm-wide IT
  - such as core analytics
Business side and technology side

- Which side are you on?
  - paid by a business unit:
    - business side
  - paid by a technology unit:
    - technology side
- Business side:
  - you tell technology what to do
  - your life is buy low, sell high
- Technology side:
  - interesting, challenging work
  - often more bureaucratic
- Power structure:
  - business used to dominate unquestionably
  - now it’s not so simple

trading/sales
quant/traders
analysts hired by the desks
traditional desk quants
sales research
front office technology groups
Firmwide IT
Business side job roles

Salesperson:
- Your job is to bring in trades
- You need business degree/knowledge
- Minimal tech savvy required
- Technology you work with:
  - Trade entry/tracking systems
  - Relative value models/historical data analysis
- Pros:
  - Working with people
  - Travel
- Cons:
  - Social skills far outweigh math ability
Business side job roles

- Trader:
  - Your job is to make money buying/selling things
  - Good product knowledge, quick reflexes, risk tolerance
  - Good grasp of modeling/technology issues
  - Technology you work with:
    - Trading systems – market data, execution, position-keeping etc
    - Pricing and risk models
  - Pros:
    - Rock star status
    - PnL is a clear performance measure
    - Tell the tech organization what to do
  - Cons:
    - Very demanding/stressful
Quantitative roles

Desk quant:
- Your job is to help trader(s) on a specific desk build and maintain models
- Good product knowledge, programming skills
- Act as a traders mouthpiece to the rest of tech organization:
  - Formulate business requirements
  - See that they are delivered
- Pros:
  - Involved in trading with no PnL risk
  - More modeling/less programming
- Cons:
  - A vanishing breed
Quantitative roles

Product structurer/Derivatives marketing:
- You design and analyze new products to meet needs of specific clients
- You are a very quantitative salesperson
- Pros:
  - Lots of number crunching if you like that
  - Client interaction in investment banking role
- Cons:
  - Presentation/sales aspect often trumps analysis
  - Very long hours
Quantitative roles

Sales Research Analyst:
- Help salespeople sell products by providing “intellectual ammunition”
- Good business knowledge, modeling skills, communication skills
- Your research output:
  - Relative value models, trade analysis, commentary
  - Client meetings
- Pros:
  - Interesting area with few set rules
  - Lots of opportunities to interact with people
- Cons:
  - More sales than research
Software developer roles

- Software developer:
  - Build models and software for specific business tasks
  - Programming and quantitative skills
  - Business knowledge a HUGE plus
  - What you do:
    - Develop, test, deploy, and support software systems
    - Create models used in such systems
  - Pros:
    - Much quieter than trading
    - A group activity
  - Cons:
    - More programming/less modeling
    - Increasingly removed from business/technology line
Software developer flavors

- Front office:
  - More lively
  - More real-time support

- Firmwide IT/risk management
  - Quieter, more software-oriented
  - Long hours for end-of-day processing

- Financial software industry:
  - Much more professional/higher quality product
  - Much less job security
Workplace realities

Hiring/career path:

Two ways to get a Wall Street job:
- Graduate programs – right out of college
- Lateral hiring – after working somewhere else

Job titles:
- Analyst – 0-3 years
- Associate – 2-6 years
- Vice President (Director) – 5-8 years
- Managing director (MD) maybe never
- God almighty?
Workplace realities

- Compensation process:
  - Base salary + annual bonus = Total Comp:
    - Analyst: all salary, little bonus
    - Managing director: almost all bonus
  - Annual awarding of bonuses a central event:
    - Timing: December through February
    - Factors:
      - firm’s performance, your business unit performance, your performance
  - Performance review process
  - Post-bonus turnover
Is Wall Street work worth it?

- The dark side:
  - Most of your waking hours spent at work
  - Often hectic/stressful – no privacy
  - Your firm wants to own your whole life

- The bright side:
  - Interesting, challenging work
  - If you are good, your quantitative/programming prowess can make a real difference
  - People do care if you do a good job (even if for purely commercial reasons)

- It’s a great place to work if you’re up to it
CSFB as a place to work:

- A leading global financial services firm:
  - First Boston culture, great building
  - Very strong in equities and prop trading
- Unusual commitment to technology:
  - Leader in algorithmic trading
  - CIO on executive board
  - IT is viewed as core competence, not as cost
- [http://www.csfbcampusrecruiting.com](http://www.csfbcampusrecruiting.com)